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THE CRAW FISH OF NORTH AMERICA.*—The Cambridge Museum has issued another of its sumptuously illustrated and printed catalogues, which the liberality of the State of Massachusetts has given it the means to do. From the hands of Dr. Hagen we have, as might be expected from his known care and accuracy in research, a monograph of much interest and value. The craw fish have been much neglected by naturalists in this country, though these fresh-water lobsters have already made their mark in the local histories of the times, by the injury they occasionally do by undermining our river dams, and especially the levee of the Mississippi near New Orleans, and the rice fields of the Southern states.

As the author refers very briefly to their burrowing habits, only alluding to the fact that a species "severely damages the rice fields of the Southern States," we would mention that according to newspaper accounts they have by tunnelling the artificial banks of the Mississippi, caused devastating floods; and while in Northern Maine we were told that the craw fish so undermined the dam at the mouth of the Aroostook River, that it was partially carried away. While craw fishes are most abundant in the Middle, Western and the Southern States, they are more common in New England than one would be led to suppose from Dr. Hagen's remarks, as he had no specimens from Maine, New Hampshire, Massachusetts, Connecticut or Rhode Island. The writer has found them frequently under stones in lakes in Northern Maine, and has had specimens from Williamstown, Mass., presented him by Mr. S. H. Scudder.

Passing over the classification and distribution of the species, we will glean some results of the author's study on the sexual peculiarities and dimorphism of these creatures. He finds that some of the females show a tendency to a more masculine development, and in some males a tendency to a feminine development. He gives a detailed account of the two sorts of males, stating that Professor Agassiz was the first to make the interesting discovery of dimorphism in the males of the genus *Cambarus*, to which all the species living east of the Rocky Mountains belong, while it does not occur in the genus *Astacus*, to which the European and Pacific coast species belong, nor in the females of either genus. The males of the first form are well developed and capable of reproduction; those of the second form are sterile, and besides certain important differences, such as the greater development of the limbs, the tarsal third of the two are articulated when they are not in the males of the first form, and the "hooks on the third article of the third, or in some groups of the third and of the fourth pair of legs are smaller and less developed. The whole body has less size and width, the sculpture is not so well finished, while the claws are shorter, narrower, and more like those of the female." He adds that "the existence of a second form of the male, if it were no more than a passage or metamorphic form, would not be ex-

* Illustrated Catalogue of the Museum of Comparative Zoology. No. III. Monograph of the North American Astacidae. By Dr. H. A. Hagen. Cambridge, 1870. Royal 8vo, pp. 109. With eleven lithograph plates.

traordinary. But the great number of full-grown second-form specimens in every species, which are often even larger than the first-form males, seems to prove that they are individuals which have remained in a sexual stage that does not agree with their corporal development, — in short, that they are perhaps sterile." This conjecture he finds supported by an anatomical examination.

We quote all the author's general remarks on Dimorphism in Crustacea and Insects (p. 24). We have noticed in the *NATURALIST*, vol. iii, p. 494, iv, p. 55, the recent discoveries of Malmgren, Ehlers, Claparède and others, regarding dimorphism in the worms, which our readers would do well to read in this connection.

"*Dimorphism in other Crustacea.*—Perhaps this fact of the existence in the crustacea of two forms, one always sterile, is not unique. In the genera *Lupa* and *Callinectes*, there are not rarely females with a very narrow and acute postabdomen. These it is very easy to separate from the ordinary females, with a large and circular postabdomen. Professor L. Agassiz informs me that he has satisfied himself, by an anatomical examination of living specimens, that these females are sterile. I have found similar females with a narrower triangular abdomen in some other genera of *Brachyura*.

I am indebted to Mr. Alexander Agassiz for the information that F. Muller, Fuer Darwin, 1864, has described two forms of the male in *Orchestia Darwinii* and in *Tanaïs dubius*. He remarks that when found upon the shore the form of the second pair of gnathopoda varies from that of the specimens found at a distance inland, where it lives under mouldy leaves in loose earth. In *O. Darwinii*, intermediate forms between the males with large and those with small hands, are not to be detected, but in two other species, *O. tucurauna* and *O. tucuratinga*, the shape of the antennæ and of the hands changes even in the full-grown males.

The supposition that the first-born males only in *Cambarus* possess large hands for burrowing purposes is to be rejected, as the females also have the same burrowing habits.

The existence of two different forms of males in *Cambarus* is very important in the description of the species, and the fact that these forms are not recognized by all preceding authors may explain some erroneous determinations in their works."

"*Dimorphism in Insects.*—The discovery of a dimorphism in the crustacea is all the more interesting, since as yet in the whole animal kingdom dimorphism was known only in the insects. There are many facts and communications scattered through entomological literature, of which a general review is very desirable. An anatomical examination of these dimorphic forms is still wanting, only the external differences having thus far been marked.

The dimorphism seems to be represented in two different ways; a difference only in the colors (dichroic forms of Brauer), or a difference in size and shape, and mostly in the female. I should remark that dimorphism, as observed in insects, occurs only in one sex of the same species, and mostly in the female. Perhaps in the ants and in the white ants—it seems more natural to range all the socially living insects, viz., the ants, bees, wasps, and white ants under the same law—a dimorphism is to be found in both sexes.

Dimorphism consisting in different colors was long since observed, especially in Lepidoptera, in the hind wings of many Orthoptera, and in the females of Agrion. In the latter genus the well-known orange-colored females are probably sterile.

Dimorphism with difference in shape and size is also often observed. A very common case is the difference in the development of the wings. The wings are either long and well-developed, or short, or entirely wanting. The short-winged Orthoptera (*Gryllus*, *Locusta*, *Blatta*, *Perla*, *Termes*, *Psocus*) have been carefully described by Messrs. Fischer, Von Siebold, Lucas, Brauer, and myself; the short-winged or apterous Hemiptera, by Westwood and Uhler (*Amphibiocoris*, *Gerrida*, etc.); the short-winged Diptera by Schumm (*Ornithobia* and *Lipoptera*). Mr. Brauer has recently given an interesting paper upon dimorphism in the genus *Neurothemis*, which belongs to the Odonata. The dimorphic females have wings with a less complicated venation and different colors. There is even a case of trimorphism in some butterflies, according to the observations of Mr. Wallace. *Papilio Ormenus*, from Celebes, has three distinct forms of females, and in some cases the number of female forms appears to be four. Dimorphism consisting in different shape and size is observed in the Lepidoptera (*Equites*, etc.), in the Coleoptera, in the Lamellicornia, and in the Longicornia, and perhaps

in the *Lymexylon* and *Hylecœtus*; in the Hymenoptera (*Cynips*); in the Diptera (*Phasia*). The dimorphism in the Dipterous genus *Phasia*, discovered by Loew, is very remarkable. Having seen his specimens, I may be permitted to add here a written communication by Mr. Loew, sent to me some years ago and still unpublished: "In the genus *Phasia* every species has two male forms; one similar to the female, and another much larger, with the wings broader and more colored, and usually the body more colored. The two forms fly at the same time and unite with the same form of females. The genital parts of the larger males are in shape and size identical with those of the smaller males. There exist some intermediate forms of males, and it is sometimes, in certain species, possible to form a complete series, which seems to unite the two different forms. I say seems, because I have never seen a male which I hesitated to place in one of the two forms."

I have noticed here the occurrence of dimorphism in the insects to show how variable in the different families and genera is the mode of dimorphism, even from that observed in the *Astacidae*. Perhaps a closer examination will disclose even some difference in the sexual parts in certain dimorphic insects, and it now seems probable that some forms, heretofore described as distinct species, will be hereafter recognized as only dimorphic variations. Still, it is possible that very different facts are to-day united under the same name of dimorphism.

Certainly the discovery of a dimorphism in another part of the *Articulata*, viz., in the *Crustacea*, leads us to suppose that it will be found also among the worms.

THE LIFTED AND SUBSIDED ROCKS OF AMERICA.*—The author's name is well known from his admirable paintings and portraits of Indian life and physiognomy. Catlin's "North American Indians," was one of the wonder books of our childhood and youth, sharing the interest of Irving's *Astoria*, Cooper's *Leather Stocking Tales*, and Tanner's *Narrative*, those manuals of Indian craft and hunters' cunning that every boy delights in reading; and leading them all in careful detail, and distinguished from all in rich, pictorial embellishment.

We turn with a degree of sadness to the present little volume, and wonder how the author could have brought himself to publish such scientific nonsense. The author has been a great traveller over the American Continent, on both hemispheres. He has studied the faces and habits of the various savage tribes he met, and from his frequent references, has evidently read the works of Dana, Lyell, and other geologists, and yet here is the result of his orographical and anthropological lucubrations. To explain the formation of mountain chains he supposes that they are due to the rush of great masses of water in the crust of the earth. He accounts for the Gulf-stream by a subterranean stream under the Rocky mountains, many times larger and twice as long as the Mississippi, which together met a similar one from under the Andes. The three "debouch unseen into the Caribbean Sea and the Gulf of Mexico;" and undermine the Antilles, in the author's glowing words "a part (and probably the glory) of the Andes," which went down in the commotion of floods and volcanoes, the floods moving northwards and thus forming the Gulf-stream. Such a "cataclysm of the Antilles," naturally disturbed the minds of the people dwelling in the Quitos and Cotopaxis of the then Antilles. Our author gravely proceeds to tell us how the unhappy race became distributed northwards, and our quotation will give a fair idea of the author's capacity for dealing with such subjects. "In the turmoil and flood of the elevated waters, the Gulf-stream first bursting out of the sunken Gulf of

* By George Catlin. London, Trubner & Co. 1870. 12mo, pp. 228.